

Vaccination status and Seroprevalence of Hepatitis B surface Antigen among Health Care Workers in Taiz, Yemen Republic

Waheed A. M. Ali ^{1*}, Riyadh Abdulmajid S. Thabit¹, Mansoor Alkhulaidi¹, Ahmed Abdullah M Ahmed¹

¹ Medical Lab. Department, Faculty of Medicine and Health Sciences. Taiz University, Yemen and Medical Lab. Department, Faculty of Medical and Health Sciences, Al-Saeed University, Taiz, Yemen

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Abstract: Background: Exposure to Hepatitis B virus (HBV) infection is one of the most common occupational diseases among the providers of the health care services. During the course of their clinical work; Health Care Workers (HCWs) are at risk of acquiring HBV infection or transmitting it to their patients. Vaccination for medical personnel against HBV in republic of Yemen is recommended but not strictly enforced. Detection of the viral hepatitis B surface antigens (HBsAg) one of the accurate and cheap methods to assess HBV prevalence. This method is used in this study to assess HBV prevalence among HCWs in Taiz; in order to improve methods of interventions to control this infection among them. Objectives: The objective of this study was to assess the vaccination status and the seroprevalence of HBsAg among HCWs in Taiz; Yemen. Methods: This cross-sectional study was conducted between January and March, 2018, and from April and July, 2019, in the part of Taiz City; Yemen. 362 HCWs were included in this study and are selected through repeated casual visits to hospitals and medical centers. A questionnaire was made to get information on the participants' characteristics and their vaccination status, medical history and risk factors for HBV transmission. Five ml venous blood was then collected from every participant to assess HBsAg. Results: the overall vaccination percentage was 21.54% (27.5% in male and 17.9% of female). The seroprevalence of HBsAg was 2.76%, all vaccinated participants were HBsAg negative. Needle stick and sharp object injury was an important risk factor of HBV infection.

Keywords: vaccination; prevalence; hepatitis B virus; Hepatitis B surface antigen; health care workers.

1. Introduction

Hepatitis B virus infection is one of most serious public health problems. It represents one of the most common viral infections worldwide. It is estimated that; more than three hundred million people are chronically infected with this virus around the world (Trepoet *al.*, 2014, Kazemiet *al.*, 2008). The carrier rate of HBV is varying considerably from one area to the another and ranging from less than 1% to more than 20%. (Aghakhaniel *al.*, 2011). More than 6.00.00 annual deaths are resulted from the complications of the liver diseases that caused by this virus (Fourati and Pawlotsky, 2016).

Fortunately; a safe, effective, and cost-efficient vaccine is available, however universal immunization especially for infants are not yet available in all low-income countries (Locarniniet

* Corresponding Author: waheed22sr@gmail.com

al., 2015, WHO, 2009). Many countries do not offer adult HBV vaccination; this lack of adult vaccination means that even that countries with high childhood vaccination rates still have high proportion of vulnerable and infected adults (Zoker *et al.*, 2017). Many antiviral medications prove effectiveness and can be used to treat chronic infection once it is diagnosed; however, cost of these medications is relatively high, so many people in low-income areas with chronic HBV are not offered treatment (Locarnini *et al.*, 2015, WHO, 2009).

Diagnosis of HBV infection can be accomplished by detecting serological markers, which varies depending on whether the infection is acute or chronic. In acute infection HBsAg appears 1 to 7 weeks before the appearance of the biological markers that indicates liver disease or before jaundice become evident, in almost half of the infected patients this marker remains even for more than 3 weeks after the onset of the disease (Trupti *et al.*, 2018). After the initial acute or asymptomatic infection, a proportion of patients becomes chronic carriers as they fail to clear the infectious material (viruses) from their blood stream and in these patients HBsAg persists for long periods, sometimes for life. The severity of the symptoms varies from one infected individual to another, a large proportion of infected individuals by HBV remain asymptomatic but can transmit the infection to healthy individuals (Quadri *et al.*, 2013). Detection of HBsAg is routinely used either for diagnosing acute state or for detecting carriers. The most common methods for detecting HBsAg are either Immunochromatography assays (ICA) which are simple to perform, economical and do not require special instrumentation for analysis or enzyme-linked immunosorbent assays (ELISA) which are relatively expensive, needs more time, special equipment and trained lab personnel for analysis. On comparison of these two methods ELISA was shown to be more sensitive for the detection of HBsAg than ICA (Zoker *et al.*, 2017, Quadri *et al.*, 2016).

Blood, serum and other body fluids, represent the main sources for HBV transmission, transmission of the virus from mother to child (vertical transmission) is also one of the common methods for transmission of this virus as well as sexual route, and exposure to unsafe injections, including intravenous drug use (Alter *et al.*, 1986, Kingsley *et al.*, 1990). Close household contact and occupational exposure to blood or blood products and hemodialysis are also important risk factors (Lauer *et al.*, 1979, Hu *et al.*, 1991). The highest occupational risk for HBV infection was reported among HCWs (Hutinet *et al.*, 2003). It is estimated that, there are more than 35 million HCWs worldwide and percutaneous (PCIs) injuries have been estimated to result in approximately 66,000 infections with HBV annually (WHO, 2016). Data reported from the United States in 1990 suggested that, the unvaccinated HCWs had serological evidence of current or past HBV infection three to five times greater than the general population (Pruss-Ustun 2005, WHO, 2013).

Unfortunately, there is no sufficient data about the situation of HBV infection among general population or among the HCWs in Taiz, Yemen or in the whole country, so the risk factors and the mode of transmission of this virus “especially in HCWs” in Yemen were not adequately elucidated. Few studies (Al-Nassiri and Raja’a, 2001, Al-Shamahy, 2000, Shidrawi *et al.*, 2004) suggest that horizontal transmission represents the major mode of infection with blood transfusion, age progression, male sex and health care occupation being significant risk factors.

This study aimed to evaluate the risk factors, the vaccination status and the prevalence of HBV infection among HCWs in Taiz City; through participants interviewing, questionnaire and laboratory examination of participants blood to measure HBsAg positivity.

2. PATINTA AND METHODS

This cross-sectional study was conducted between January and March, 2018, and from April and July, 2019, in the part of Taiz City. The population of this study included all doctors, dentists, nurses and lab technicians working in different hospitals and Medical Centers in addition to medical student at the final (clinical) years. The 362 participants included in this study were those present in hospitals and medical centers at the time of the repeated casual visits and those give consent after explanation of the aim of the study. The actual number of HCWs in the area of study was not known due to the war in the country and the emigration of several HCWs from Taiz to other cities in the country or to other countries, so to make sure that the results will be representative, a relatively large percentage of HCWs in Taiz were included in this study through two consecutive years.

A questionnaire was made to get data about the participants' characteristics and their vaccination status, medical history then taken to detect if the participants are exposed to any risk factor.

From every participant, 5 ml venous blood was collected from the cubital fossa via venipuncture. Samples were then transported to the biochemical laboratory in faculty of medical and health sciences Al-Saeed University, blood sample then left to clot at room temperature, and then centrifuged for 10 minutes, serum then separated and stored in eppendorf tubes at -20°C at Al-Rawdha hospital until the time of testing.

Testing for HBsAg was then performed to all samples by using ELISA {biorexfars, unit 2C antrum technology park, Antrum, BT41 1QS (United Kingdom)}. In any sample, levels of HBsAg less than 1 s/c (signal per cutoff) were considered negative, while a level more than 5 s/c was considered positive.

All collected data were checked, data were then entered into the computer, cleaned and analyzed. Means and percentages were calculated. SPSS version 21.0 software package was used to determine differences ($P < 0.05$) performed by Cramer's value and K^2 test.

3. RESULTS

A total of 362 participants with mean age of 28.5 years (range from 20 to 59), 138 (38.1%) males and 224 (61.9%) females, were included in this study. The distribution of participant according to their occupation is summarized in table 1. Results, table 2 explains the number and the percentages of vaccinated participants according to their age and sex.

Table 1. Distribution of study participant according to their occupation

Occupation	Frequency	Percentage
Physician	68	18.8%
Dentists	38	10.5%
Lab. Technician	142	39.2%
Pharmacist	26	7.2%
Nurse	88	24.3%
Total	362	100%

Table 2. Vaccination status among HCWs in Taiz according to gender and age groups

		Vaccinated	Non-Vaccinated	Total
Gender	Male	38 (27.5%)	100 (72.5%)	138
	Female	40 (17.9%)	184 (82.1%)	224
Age	20-30 years	48 (16.6%)	242 (83.4%)	290
	Over 30 years	30 (41.7%)	42 (58.3%)	72

On examination of participant's blood for HBsAg; 10 of 362 (2.76%) were gave positive results, the incidence of HBsAg positivity found to be relatively higher in female, 8 of 224 (3.57 %) than males, 2 of 138 (1.44%) (table 3). According to age groups, the percentage HBsAg positivity was 5.56% (4 of 72) in age group over 30 years while it was 2.07% (6 of 290) among participants 20 and 30 years old (table 4).

Table 3. Seroprevalence HBsAg among HCWs in Taiz according to the gender

			Result		Total	Phi & Cramre's value
			Positive	Negative		
Gender	Male	Count	2	136	138	R Q = 0.50
		Percentage	1.44%	98.56%	100%	
	Female	Count	8	216	224	
		Percentage	3.57 %	96.43%	100%	
Total		Count	10	352	362	
		Percentage	2.76%	97.24%	100%	

Table 4. Seroprevalence of HBsAg among HCWs in Taiz according to the age

			Result		Total	Phi & Cramre's value
			Positive	Negative		
Age group	20-30	Count	6	284	290	R Q = 0.301
		Percentage	2.07%	97.93%	100%	
	Over	Count	4	68	72	
		Percentage	5.56%	94.44%	100%	
Total		Count	10	352	362	
		Percentage	2.76%	97.24%	100%	

Only 78 (21.54%) of the participants were knew that they had taken the three doses of HBV vaccine, all of them were HBsAg negative.

Table 5. HBsAg among vaccinated and non-vaccinated participants

Categories	Vaccinated		Non-vaccinated		Phi & Cramre's value
	No	%	No	%	
Total	78	21.54%	284	78.45%	R Q = - 0.1
HBsAg positive	Zero	0%	10	3.52%	
HBsAg negative	78	100%	274	96.48%	

Of the 362 participants included in this study, thirteen (3.6%) had previously received blood transfusion in at least in one situation; no direct correlation was found between blood transfusion and the prevalence of hepatitis B among HCWs in Taiz; since only one of these 13 participants is HBsAg positive. 63 of participants (17.4%) had accidentally exposed to needle stick injury (NSIs) at least once during their work, four of them are HBsAg positive.

Table 6. prevalence of HBV according to the history of NSIs

Categories	History of NSIs		No history of NSIs		Phi & Cramre's value
	No	%	No	%	
HBsAg positive	4	6.35%	6	2%	R Q = 0.1005
HBsAg negative	59	89.75%	293	98%	
Total	63	100%	299	100%	

4. DISCUSSION

The study assessed vaccination status and the prevalence of HBV through the measuring of HBsAg in HCWs in Taiz city; Yemen Republic. The importance of this study referred to the fact that HBV is one the major occupational infectious diseases in the medical staff (Hutin *et al.*, 2003) and the paucity of studies on epidemiology of HBV infection both in general and at risk population in Yemen.

The number of female participants in this study was more than males. This could be attributed to the increase rate of immigration between male HCWs to the outside of the city compared to female. This reason could also be responsible for the decrease in participants' age ratio since more chances for immigration are given to the more experienced HCWs.

In spite the fact that hepatitis B is preventable disease it represents one of the major causes of morbidity and mortality throughout the world including Yemen. Vaccination against this virus is highly effective and protect populations especially those at high risk if the vaccination programs are properly implemented (Mast *et al.*, 2005). World health organization reported that, hepatitis B vaccination coverage varies among HCWs in different areas of the world. This vaccination coverage was about 18% in Africa and about 77% in Australia and New Zeland (Pruss-Ustunel *et al.*, 2005).

In this study about 2.5% of health professionals have received the full three doses course of HBV vaccine (mean of male and female percentages), this percentage is even less than that reported from Ethiopia (28.7%) the neighbor countries with relatively same socioeconomic and income level.

The mean of vaccination coverage among HCWs in this study is less than that reported in Iran, India and also less than that reported from Burkina Faso, which indicates vaccination coverage of 48.2, 51.2 and 47.7, respectively (Ouedraogo *et al.*, 2013, Nagao *et al.*, 2008, Jalaleddinet *al.*, 2014).

Unavailability of the vaccine was the most common mentioned reason by HCWs participates in this study for not being vaccinated; the second common mentioned reason was the vaccine cost. The fact that most of the participants in this study were young and had few years of practice could also be responsible for the low rate of vaccination as it was found in this study that the rate of vaccination is less in participants with age group less than 30 than those over 30.

In this study the overall prevalence of HBV infection was 2.8%, it was higher in female 3.57% than in male 1.44%. This is equal to that reported in Nigeria in 2017 (Alesee *et al.*, 2016) but higher than that reported in study conducted in India (0.4%) (Singhal *et al.*, 2016). In African countries, 3 studies conducted in Rwanda (Kateera *et al.*, 2014) 8.1% in Uganda (Ziraba *et al.*, 2010) and 6.32% in Cameroon (Fritzsche *et al.*, 2013) and the prevalence of HBV in HCWs in these studies can be said to be higher compared to that reported in the present study.

The higher prevalence of HBV infection in females in this study compared to male may be attributed to the relatively decrease vaccination rate in female than males and to the fact that most of workers in nursing (higher exposure rate) are female. Prevalence of HBV infection was more in age group more than 30 years old than those less than 30 years, this could be attributed to the increase rate of exposure.

The present study's obvious statistically significant inverse correlation was seen between vaccination state and HBsAg positivity, which means that; vaccination program against HBV is highly effective in preventing HBV infection and the need to ensure that all HCWs should be vaccinated.

Sixty three of 362 participants (17.4%) included in this study said that they had needle and/or sharp object injury at least once during the previous one year. This finding is lower than that reported by study conducted in Ondo state, Nigeria, where 55.8% of HCWs encounter needle stick and/or sharp object injuries (Oluwatosin *et al.*, 2016). However, it is relatively similar to that reported by a study done in Ethiopia, where 19.1% had needle stick and/or sharp injury (Bekele *et al.*, 2015). This low percentage in our and in Ethiopian studies compared with that reported from a country with relatively same socioeconomic and demographic characteristics could be attributed to training programs that advocate for proper self-care as well as for study time differences. Strong statistically significant positive correlation was seen between the rate of needle stick and/or sharp injury and the prevalence of HBsAg seropositivity. It is well known that safe handling and disposal of needles sticks and sharp materials by health care professionals decreases blood born infection including HBV.

5. CONCLUSION

According to the relatively higher prevalence of HBsAg among HCWs; test for screening HBV infection should be performed in primary evaluation before giving permission to every HCW to be enrolled in hospital and health centers. HBV vaccination showed good coverage protective rate against HBV. Therefore, it should be compulsory to all HCWs. Needle stick and/or sharp object injuries are important risk factors for HBV infection, therefore, HCWs should be enrolled in periodic

training programs to fill the skill gap, and to be enforced to apply universal precaution during health providing procedures.

References

- Alese OO, Alese MO, Ohunakin A, Oluyide PO (2016). Seroprevalence of hepatitis B surface antigen and occupational risk factors among health care workers in Ekiti state, Nigeria. *J Clin Diagn Res.*;10:LC16–8.
- Al-Nassiri KA, Raja'a YA (2001). Hepatitis B infection in Yemenis in Sana'a: pattern and risk factors. *East Mediterr Health J*; 7:147–52.
- Al-Shamahy H (2000). Prevalence of hepatitis B surface antigen and risk factors of HBV infection in a sample of healthy mothers and their infants in Sana'a, Yemen. *Ann Saudi Med*; 20:464–6.
- Alter M J, Ahtone J, Weisfuse I, Starko K, Vacalis T D, and Maynard J E (1986). "Hepatitis B virus transmission between hetero- sexuals," *The Journal of the American Medical Association*; 256:1307–1310.
- Bekele T, Gebremariam A, Kaso M, and Ahmed K (2015). "Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in bale zone, Southeast Ethiopia," *PLoS ONE*,10: 10, Article ID 140382.
- Fourati S and Pawlotsky JM (2016). Recent advances in understanding and diagnosing hepatitis B virus infection [version 1; referees: 2 approved]. *F1000 Research*, 5(F1000 Faculty Rev): 2243 (doi: 10.12688/f1000research.8983.1)
- Fritzsche C, Becker F, Hemmer C, Riebold D, Klammt S, Hufert F (2013). Hepatitis B and C: Neglected diseases among health care workers in Cameroon. *Trans R Soc Trop Med Hyg.*;107:158–64.
- Hu D J, Kane M and Heymann D L (1991). Transmission of HIV, hepatitis B virus, and other blood borne pathogens in health care settings: a review of risk factors and guidelines for prevention" *Bulletin of the World Health Organization*; 69: 623– 630.
- Hutin Y, Hauri A, Chiarello L, Catlin M, Stilwell B, Ghebrehiwet T (2003). Best infection control practices for intradermal, subcutaneous, and intramuscular needle injections. *Bull World Health Organ.*;81:491–500.
- Jalaleddin H, Zahra A, Kimia N, Hesameddin H and Zahra H (2014). "Attitudes and Practice of Hepatitis B vaccination among Iranian dentists," *International Journal of Collaborative Research on Internal Medicine & Public Health.*; 6: 199–206.
- Kateera F, Walker TD, Mutesa L, Mutabazi V, Musabeyesu E, Mukabatsinda C (2014). Hepatitis B and C seroprevalence among health care workers in a tertiary hospital in Rwanda. *Trans R Soc Trop Med Hyg.*;109:203–8.
- Kazemi A, Koosha A, Rafizadeh B, Mousavinasab N, Mahram M (2008). Serum level of anti-hepatitis B surface antigen 6-8 years after hepatitis B vaccination at birth. *East Mediterr Health J.*;14: 960–5.
- Kingsley L A, Rinaldo C R. J, Lyter D W, Valdiserri, R. O S. H.Belle, and M.Ho (1990). Sexual transmission efficiency of hepatitis B virus and human immunodeficiency virus among homosexual men. *The Journal of the American Medical Association*; 264: 230–234.
- Lauer J L, VanDrunen N A, Washburn J W and Balfou H H J (1979). "Transmission of hepatitis B virus in clinical laboratory areas," *Journal of Infectious Diseases*; 140: 513–516.
- Locarnini S, Hatzakis A, Chen DS, Lok A (2015). Strategies to control hepatitis B: Public policy, epidemiology, vaccine and drugs. *J Hepatol*; 62 : 76-86.
- Mast E E, Margolis H S and Fior A E e (2005). "A comprehensive immunization strategy to eliminate transmission of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices (ACIP) part1: immunization of infants, children, and adolescents," *MMWR Recommendations and Reports*; 54: 1–31.
- Nagao Y, Matsuoka H, Kawaguchi T, Ide T and Sata M (2008). "HBV and HCV infection in Japanese dental care workers," *International Journal of Molecular Medicine*; 21: 791–799.

- Oluwatosin O, Oladapo M, and Asuzu M (2016). "Needlestick injuries among health care workers in Ondo State, Nigeria," *International Journal of Medicine and Public Health*; 6: 31.
- Ouedraogo H G, Kouanda S and Tiendrebeogo S (2013). "Hepatitis B vaccination status and associated factors among health care workers in Burkina Faso," in *Medecine Et SanteTropicales*; 23: 72–77,
- Pruss-Ustun A, Rapiti E and Hutin Y (2005). "Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers," *The American Journal of Industrial Medicine*; 48: 482–490.
- Quadri PA, Tekam S, Gedam DS, Gujar V, Deshmukh D (2016). Prevalence of Hepatitis B surface antigen (HBsAg) positivity among general population in Yavatmal (Maharashtra), India. *Int. J. Curr. Microbiol. App. Sci.*; 5: 513-517.
- Quadri SA, Dadapeer HJ, Arifulla M, Khan N (2013). Prevalence of Hepatitis B surface antigen in hospital-based population in Bijapur, Karnataka. *Al Ameen J Med Sci.*; 6:180-182.
- Seroprevalence of markers of viral hepatitis in Yemeni healthcare workers. *J Med Virol*; 73:562–5.
- Shidrawi R, Al-Huraibi AA, Al-Haimi MA, Dayton R, Murray-Lyon IM (2004).
- Singhal V, Bora D, Singh S (2011). Prevalence of hepatitis B virus infection in healthcare workers of a tertiary care centre in India and their vaccination status. *J Vaccines Vaccin.*;2:2.
- Trepo C Aghakhani A, Banifazl M, Izadi N, McFarland W, Sofian M, Khadem-Sadegh A (2011). Persistence of antibody to hepatitis B surface antigen among vaccinated children in a low hepatitis B virus endemic area. *World J Pediatr.*;7(4):358–60.
- Trepo C, Chan HL, Lok A (2014). Hepatitis B virus infection. *Lancet*; 384:2053-63.
- Trupti B. Naik, J.V. Sathish and Mita D (2018). Wadekar. Seroprevalence of Hepatitis B Surface Antigen (HBsAg) among Patients Attending a Tertiary Care Hospital at Chamarajanagar, Karnataka, India. *Int. J. Curr. Microbiol. App. Sci.*; 7: 1279-1284.
- World Health Organization (2009). Hepatitis B vaccines. *Wkly Epidemiol Rec*; 84:405-19.
- World Health Organization (2013). "Global policy report on the prevention and control of viral hepatitis in WHO Member States," Tech. Rep., World Health Organization, Geneva, Switzerland.
- World Health Organization (2016). Health Care Worker Safety [cited 2016 16.12.2016].
- Ziraba AK, Bwogi J, Namale A, Wainaina CW, Mayanja-Kizza H (2010). Sero-prevalence and risk factors for hepatitis B virus infection among health care workers in a tertiary hospital in Uganda. *BMC Infect Dis*; 10:191.
- Zoker EM, Sundufu AJ, Jacobsen KH (2017). Seroprevalence of hepatitis B surface antigen in urban Bo, Sierra Leone. *Trop J Med Res*; 20:41-4.